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ONLINE DATABASES: TODAY AND TOMORROW

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Abstract

The number of online databases publicly available worldwide has steadily increased over the last twenty years, from only a handful in the early 1970s to almost 5000 today. Not surprisingly, more people are conducting more searches and retrieving more information than at any time before. Even more changes are coming. Five major factors will influence online database development in the near-term future: 1) developments in telecommunications; 2) improvements in scanning and storage technologies; 3) expansion of database distribution options; 4) more complex needs and demands of a broader base of database users; and, 5) changes in the dynamics of database production.

1. The Past and Present

Twenty years ago the first online databases became publicly available. Systems were small in 1972; DIALOG, for example, started with just the ERIC database. Then, as now, most database producers were government agencies, professional societies, or publishers who leased their information products to online services. Unlike now, online systems in the early 1970s were dominated by government produced files, required direct dial access (there were no telecommunications networks), modem access speeds were slow, terminals were primitive, and users were few. The early databases were almost all bibliographic (indexing/abstracting.)

In these twenty years we have seen many changes in the online database industry, most of which reflect steady growth and success. Figure 1 shows how the total number of databases has grown in the last decade to almost 5000. Online systems that mount these databases have increased from a few to over 700, as counted in the Cuadra/Elsevier

Directory of Online Databases. The companies that produce databases has increased to over 2100.

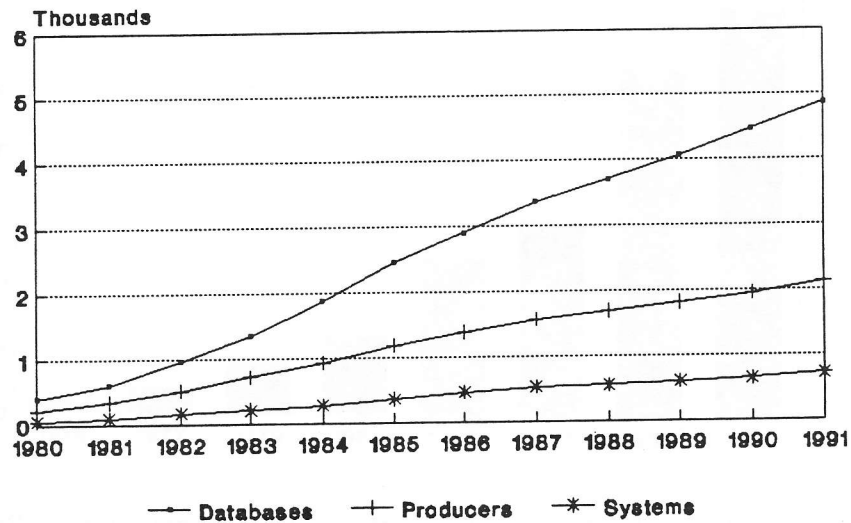


Figure 1 Growth of databases, database producers, and online systems. *Directory of Online Databases*, NY: Cuadra/Elsevier, 1991.

This dramatic growth means that searchers are retrieving much more information than in the past. As can be seen in Figure 2, the total number of records available online is estimated by Williams to be 3,569,000,000, with an average of 627,000 records per database. Over 200 databases have more than a million records. (If these are not counted, the average number of records per database is 118,000.) More searchers do more online searches on more and larger databases than ever before. (see Figure 3).

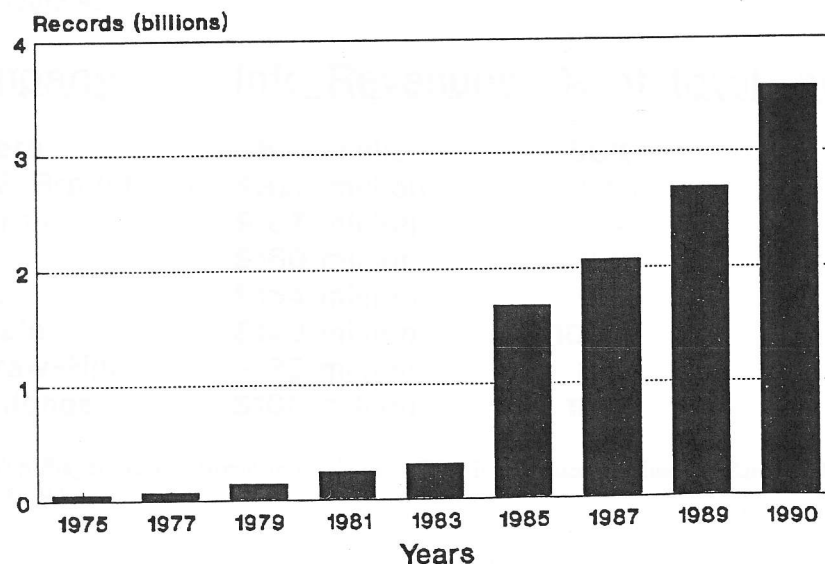


Figure 2 Growth in database records. Williams, M. E., "The State of Databases Today: 1991." In: *Computer Readable Databases*, Detroit: Gale, 1991.

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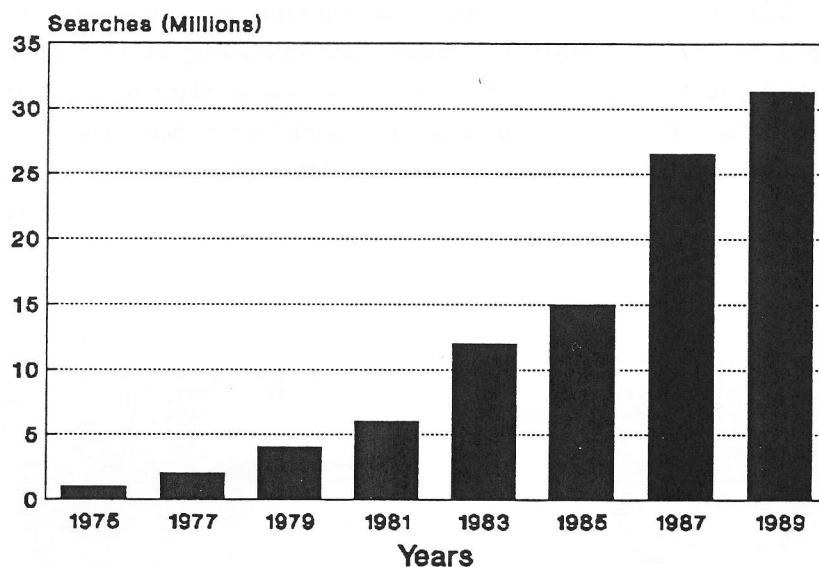


Figure 3 Growth in online searches. Williams, M. E., "The State of Databases Today: 1991". In: *Computer Readable Databases*, Detroit: Gale, 1991.

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The online industry has not been a complete success story. Many small database producers and online vendors receive very little use. Some major systems and databases dominate the online industry--few databases get used a lot, many get used only a little. According to *Business Week* magazine "Lots of companies find [the information business] alluring. But only a few are making money." They found that only eight companies made \$100 million or more in electronic information revenues in 1985. These "top players" are shown in Figure 4.

<u>Company</u>	<u>Info Revenues</u>	<u>% of total revenue</u>
Reuters	\$505 million	80%
Dun & Bradstreet	\$325 million	12%
Quotron	\$187 million	91%
TRW	\$160 million	3%
Mead	\$154 million	6%
Telerate	\$149 million	100%
McGraw-Hill	\$120 million	8%
Dow Jones	\$100 million	10%

Figure 4 Top Players in Electronic Information. "The Information Business." *Business Week* (August 25, 1986): 82-90.

991." In:

According to Cuadra's *Online Database Selection*, "in the early 1970s, most of the publicly available databases were produced in the U.S. and distributed through U.S.-based

online services." This is certainly no longer true, although the U.S. still accounts for slightly over 50% of producers and systems. Cuadra's analysis in 1989 found database producers in 34 countries and online systems in 29. Figures 5 and 6 show which regions have the most database producers and online systems. Williams identified six countries that now produce 100 or more databases (U.S., England, Canada, Germany, France, and Australia).

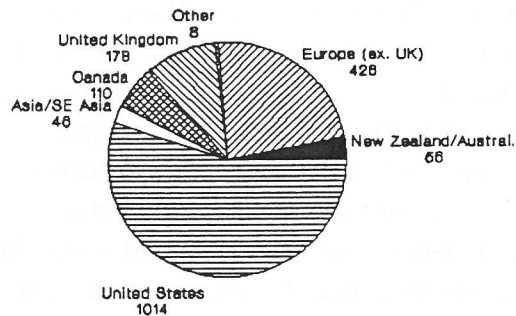


Figure 5 Database Producers in the world. *Online Database Selection*. NY: Cuadra/Elsevier, 1989.

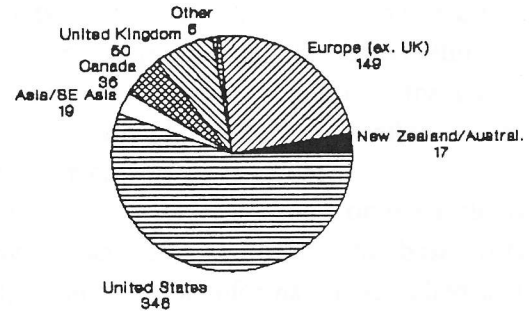


Figure 6 Online Systems in the world. *Online Database Selection*. NY: Cuadra/Elsevier, 1989.

2. The Future

The next few years are likely to bring even more dramatic growth and changes to all aspects of the online information industry. Some of these changes will result from technological factors, other factors are societal, still others economic. The five factors I will examine are: 1) developments in telecommunications; 2) improvements in scanning and storage technologies; 3) expansion of database distribution options; 4) more complex needs and demands of a broader base of database users; and, 5) changes in the dynamics of database production.

2.1 Developments in Telecommunications

The first widespread telecommunications networks to provide inexpensive access to online systems became available in the mid 1970s. Today there are telecommunications network nodes in most cities in the world, linking users to almost all online systems. That's old news by now; what is changing is the speed and quality of communications via these networks.

In 1975 300 bps seemed fast compared to 110 TELEX access. Today most remote access online systems operate at 2400 bps (although many users still only have 1200 bps modems.) To people accustomed to searching on Local Area Networks, even 2400 bps seems incredibly slow. Recently a few online systems began offering 9600 bps access over voice grade lines and more will follow. Telephone companies are switching to 56Kbps with the ongoing

conversion to digital phones. Not only will the access speed be much faster, but the transmission quality will be superior. Fiber optic transmission lines are being installed around the world, with major metropolitan areas generally first. Data rates and transmission quality will be going up dramatically in the next few years.

Higher access speeds with better quality will have some interesting impacts on the information industry and online users. Much online searching is done by reading and browsing texts once they are searched and retrieved. No one's eye can keep up even with 9600 bps, so the effective speed is much reduced as users pause to read and think. It may be more cost-effective to download massive amounts of information and postpone reading and thinking until after logoff--a practice that scares many producers. Once something is downloaded it can be transferred to a word processing or database program on the user's own computer. Nothing but conscience over possible copyright violations prohibits a user from changing and reusing the information without paying further royalties.

Another impact has been changes in pricing algorithms. Although most online systems still charge by the connect hour, others have already changed to algorithms that base costs on characters transmitted, disk accesses required, or amount of information searched and retrieved. The new algorithms don't punish the user with a slower modem. Higher access speeds will undoubtedly force all online systems to rethink their pricing policies. Differentials based on access speed, more reliance on charging for amount of information transmitted rather than connect hour, and flat fee contracts by the month will become more common.

A negative impact of higher access speed has been unacceptable rates of line noise due to low quality voice grade telephone lines. Until fiber optic lines are in place, at 9600 bps, line noise may garble an entire record. This problem is especially acute in countries with poor telephone system infrastructure.

Higher transmission speeds allow more digital information to be transmitted at a reasonable cost. High quality graphics will be transmitted in a reasonable time, something that will dramatically change the appearance of online databases. Still mostly numbers or text-based, online systems will incorporate more tables, charts, pictures, and other graphics. Equipment on the receiving end must, of course, be able to capture and print these bit-intensive transmissions.

2.2 Improvements in Scanning and Storage Technologies

Speedy transmission is not the only factor needed to enhance textual databases with graphics. Conversion of graphics in print products has not been easily done until recently. Better scanners and improvements in storage technology allow complete texts to be converted and stored. Coupled with higher rates of data transmission, online databases that more closely resemble print counterparts, but offer value far beyond print, will become common. Optical disc databases already commonly contain pictures, motion, and sound and online will feel the need to compete.

Improved storage technology at the online system end will mean not only more graphics online but larger and larger databases. Bibliographic databases with millions and tens of

millions of records will become more common, as will very large full text databases. Improved scanning coupled with massive amounts of storage and high speed transmission will result in a rapid growth of full text databases in the next few years. Full text adjuncts to bibliographic databases will become the rule rather than the exception.

Increased storage capacity at the user's end will make the downloading of massive amounts of information possible. So much information online or downloaded is not always positive. Searches that retrieve thousands of records or millions of full text characters present the problem of information overload. Database producers will need to face the issue of offering more quality filters to the data they present.

2.3 Expansion of Distribution Options

The online information industry has taken notice of the success of CD-ROM for database distribution. While it took many years to establish widespread use of online databases, CD-ROM has established itself in the library market in just a few years. Many academic libraries are reporting drastic reductions in the amount of online searching as they purchase more sources on CD-ROM.

On the whole, however, it appears that CD-ROM is providing database access to a new group of users. It is expanding markets rather than replacing them. Information Access Company reports "Online revenues are certainly going up; there has been no impact in our traditional online market which is corporate libraries." According to Libby Trudell, Marketing Manager at DIALOG Information Services, "in some cases CD increases online use because it makes users more aware of electronic reference sources. We have seen some replacement, but there is not a consistent pattern."

One impact of CD-ROM has been the need for online systems to emphasize the relative benefits of online access over CD-ROM. The most up-to-date information is only available online and database producers and online systems are rushing to enhance update schedules. Wire services are updated continuously throughout the day and night on several online systems; other databases that used to be updated monthly are now updated weekly or even daily.

In the next few years other optical media will open new distribution options to compete with online. Multimedia CD-ROM, CDTV and CD-I all offer electronic publications that look much more attractive than ASCII text online. They offer high resolution graphics, photographs, moving pictures, and sound in addition to text. They allow interaction with the contents and offer the user to get involved with the learning process. These products are visually attractive and appeal to a much wider audience than online systems.

2.4 More Users

More distribution options means more users of electronic information. As people get accustomed to different types of information, there will be a downturn in the reliance on printed sources and an increase in the users online. These new users will have different

expectations and experiences with electronic information. Current interfaces will not be sufficient.

Better interfaces that accommodate a range of expertise will become more common in the next few years. Online vendors already know that they cannot hope to attract a widespread end user market with the command driven interfaces of the last twenty years. The option of menus is here now, graphical interfaces and more innovation and choices in interface will be coming online soon. Enhanced search features will also be a part of the new search software. Competition between online systems will force more powerful, yet easier-to-use software for online searching.

Development of expert online systems is ongoing now and more will be available for access to the large publicly available online systems. Some of these expert system interfaces are sold by third parties as part of a front end communications software package. The major online systems will offer their own expert system interfaces as well in order to compete in the end user market. They will incorporate the search strategies and knowledge of experienced searchers as well as knowledge of the grammatical structure of the texts being searched. Value added fields such as controlled vocabulary descriptors will be an important part of expert system development.

2.5 Changes in the Dynamics of the Industry

Online database use is a worldwide phenomenon, yet a majority of the large databases and online systems are produced by United States companies. This is beginning to change in several ways. One way is that U.S. information companies are being purchased by non-U.S. corporations, even though production and offices may stay in the U.S. Robert Maxwell now owns two of the popular online systems, ORBIT and BRS, (Maxwell Online) in addition to Pergamon (a British firm.)

Another way the market is getting more global is the improvement of telecommunications networks and systems in countries around the world. Some areas still have a difficult time doing online searching because of poor communications infrastructure. With more reliance on satellite communications this is expected to change.

In the U.S. more database producers and online systems are private, for-profit companies. The government role in databases is shrinking. This trend will continue in the U.S., but in other countries governments are getting more involved in database production. The Japanese government, for example, is fostering strategic partnerships between government and industry. Large capital investments in the information industry will result in a larger market share to these countries' databases.

Since many small database producers are not making money, market fallout will occur in the next few years. Some of the smaller companies will get out of the electronic information business all together. The larger companies will get bigger as competition declines. The total number of databases, database producers, and online systems will continue to go up, however, as more traditional print information companies expand to electronic information. Much of this expansion will be in CD-ROM as well as online.

The forces of change are already here in the online information industry. More information available at faster access speeds to more people will be the rule for the coming years. We will see changes as producers are forced to rethink pricing policies, database enhancements with graphics, system enhancements with better software and interfaces, and some way to help users cope with so much information.

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About the author

Carol Tenopir is an Associate Professor at the School of Library and Information Studies, University of Hawaii at Manoa. From 1976-1979 she was the Vice-President of Operations at an information management consulting firm in California and from 1979-1981 the Systems Librarian at the University of Hawaii. She holds a PhD degree in Information Science from the University of Illinois. Her monthly column "Online Databases" has appeared in *Library Journal* since 1983 and she is the author of several books and many articles about online database searching.